

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
22 January 2004 (22.01.2004)

PCT

(10) International Publication Number
WO 2004/008481 A1

(51) International Patent Classification⁷: H01J 49/40

Anatoli, N. [RU/RU]; 7-Scherbakov per., Apt. #6, St. Petersburg, 192001 (RU).

(21) International Application Number:
PCT/US2003/013262

(74) Agent: KANE, Barry, C.; Miller, Johnson, Snell & Cumiskey, P.L.C., Calder Plaza Buzilding, 250 Monroe Avenue, N.W., Suite 800, P.O.Bo 306, Grand Rapids, MI 49501-0306 (US).

(22) International Filing Date: 29 April 2003 (29.04.2003)

(25) Filing Language: English

(81) Designated States (*national*): AU, BY, CA, CN, GE, HU, ID, IL, IN, JP, KP, KR, NO, NZ, PL, RO, RU, UA, US.

(26) Publication Language: English

(30) Priority Data:
GB 0216438.2 16 July 2002 (16.07.2002) GB

(84) Designated States (*regional*): European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR).

(71) Applicant (*for all designated States except US*): LECO CORPORATION [US/US]; 3000 Lakeview Avenue, St. Joseph, MI 49085-2396 (US).

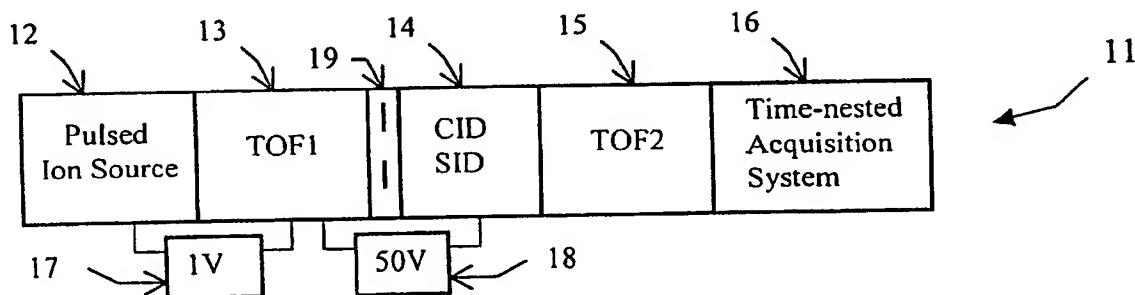
Published:
— with international search report

(72) Inventor; and

(75) Inventor/Applicant (*for US only*): VERENTCHIKOV,

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: TANDEM TIME OF FLIGHT MASS SPECTROMETER AND METHOD OF USE



(57) Abstract: To provide comprehensive (*i.e.* rapid and sensitive) MS-MS analysis, the inventor employs a time-nested separation, using two time-of-flight (TOF) mass spectrometers. Parent ions are separated in a slow and long TOF1, operating at low ion energy (1 to 100eV), and fragment ions are mass analyzed in a fast and short TOF2, operating at much higher keV energy. Low energy fragmentation cell between TOF1 and TOF2 is tailored to accelerate fragmentation and dampening steps, mostly by shortening the cell and employing higher gas pressure. Since separation in TOF1 takes milliseconds and mass analysis in TOF2- microseconds, the invention provides comprehensive MS-MS analysis of multiple precursor ions per single ion pulse. Slow separation in TOF1 becomes possible with an introduction of novel TOF1 analyzers. The TOF-TOF could be implemented using a static TOF1, here described on the examples of spiratron, planar and cylindrical multi-pass separators with griddles spatial focusing ion mirrors. Higher performance is expected with the use of novel hybrid TOF 1 analyzers, combining radio frequency (RF) and quadratic DC fields. RF field retains low-energy ions within TOF 1 analyzer, while quadratic DC field improves resolution by compensate for large relative energy spread.

BEST AVAILABLE COPY

WO 2004/008481 A1